

CLAIMS

What is claimed is:

1. A variable length instruction pipeline comprising:
 - a first pipeline stage;
 - a first expansion stage coupled to the first pipeline stage; and
 - a second pipeline stage coupled to the first pipeline stage and the first expansion stage, wherein the second pipeline stage is configured to selectively receive instructions from the first pipeline stage or the first expansion stage.
2. The variable length instruction pipeline of Claim 1, further comprising a multiplexer coupled between the first expansion stage and the second pipeline stage and between the first pipeline stage and the second pipeline stage.
3. The variable length instruction pipeline of Claim 1, further comprising a second expansion stage coupled to the first pipeline stage and the first expansion stage and wherein the first expansion stage is configured to selectively receive instructions from the first pipeline stage or the second expansion stage.
4. The variable length instruction pipeline of Claim 3, further comprising a multiplexer coupled between the second expansion stage and the first expansion stage and between the first pipeline stage and the first expansion stage.

5. The variable length instruction pipeline of Claim 1, further comprising a third pipeline stage coupled to the second pipeline stage.

6. The variable length instruction pipeline of Claim 1, wherein the first pipeline stage is part of an instruction fetch and decode unit.

7. The variable length instruction pipeline of Claim 6, wherein the instruction fetch and issue unit further comprises an instruction fetch stage coupled to the first pipeline stage.

8. The variable length instruction pipeline of Claim 1, wherein the second pipeline stage is a decode stage.

9. The variable length instruction pipeline of Claim 1, wherein the variable length instruction pipeline is configured to process integer instructions.

10. The variable length instruction pipeline of Claim 1, wherein the first pipeline stage issues an instruction to the first expansion stage when the second pipeline stage is full.

11. A method of avoiding pipeline stalls using a variable length instruction pipeline having a first pipeline stage, a first expansion stage, and a second pipeline stage, the method comprising:

issuing a first instruction from the first pipeline stage to the second pipeline stage if the second pipeline stage can accept the first instruction;

issuing the first instruction to the first expansion stage when the second pipeline stage can not accept the first instruction.

12. The method of Claim 11, further comprising issuing a second instruction to a second expansion stage when the first expansion stage retains the first instruction.

13. The method of Claim 12, further comprising issuing the second instruction from the second expansion stage to the first expansion stage when the first expansion stage can receive the second instruction.

14. The method of Claim 13, further comprising issuing a third instruction from the first pipeline stage to the first expansion stage when the second instruction leaves the first expansion stage.

15. The method of Claim 15, further comprising issuing a fourth instruction from the first pipeline stage to the second pipeline stage when the third instruction leaves the second pipeline stage.

16. The method of Claim 11, further comprising issuing a second instruction from the first pipeline stage to the first expansion stage when the first instruction leaves the first expansion stage.

17. The method of Claim 16, further comprising issuing a third instruction from the first pipeline stage to the first pipeline stage when the second instruction leaves the first pipeline stage.

18. A variable length instruction pipeline comprising:

a first pipeline stage;

a first expansion stage coupled to the first pipeline stage; and

a second pipeline stage coupled to the first pipeline stage and the first expansion stage,

wherein the first pipeline stage is configured to issue a first instruction into the first expansion stage when the second pipeline stage can not receive an instruction.

19. The variable length instruction pipeline of Claim 18, further comprising a multiplexer coupled between the first expansion stage and the second pipeline stage and between the first pipeline stage and the second pipeline stage.

20. The variable length instruction pipeline of Claim 18, further comprising a second expansion stage coupled to the first pipeline stage and the first expansion stage and wherein the first pipeline stage is configured to issue a second instruction to the second expansion stage when the first instruction is in the first expansion stage.

21. The variable length instruction pipeline of Claim 20, further comprising a multiplexer coupled between the second expansion stage and the first expansion stage and between the first pipeline stage and the first expansion stage.

22. The variable length instruction pipeline of Claim 18, further comprising a third pipeline stage coupled to the second pipeline stage.

Year	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100
1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	